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SHORT REPORT

Accuracy of Duplex Scan of Internal Carotid Arteries

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Key Words: Carotid artery stenosis; Duplex; Angiography.

Introduction

For identification of internal carotid artery (ICA) stenosis, angiography is still considered the gold standard while duplex scan has been introduced as a non-invasive, less expensive alternative. We report the accuracy of duplex performed at our centre to detect occlusion as well as high grade (≥70%) stenosis of the ICA.

Report

In a prospective study, 65 consecutive patients with suspected symptomatic high grade ICA stenosis were examined during a 12 months period 1998–99. Using a Siemens Sonoline Elegra, Siemens Medical System, Washington, U.S.A., and an angle of insonation of below 60%, flow velocities within the common carotid artery (CCA) and the ICA were obtained bilaterally. The degree of stenosis was determined using a modification of the criterias developed by Zwiebel. Hence, a ≥70% stenosis was characterised by an ICA peak systolic velocity $\geq 150\,cm\,s^{-1}$, an ICA end diastolic velocity $\geq 90\,cm\,s^{-1}$, and a PSV ratio > 2.8. No flow indicated occlusion.[1]

From selective carotid angiography the degree of stenosis was calculated using the NASCET method.[2]

Duplex scan and angiography were performed blinded of the other and in random order within 2 days of each other, an overall agreement of 88% (kappa = 0.80) was obtained (Table 1). Five ICAs were identified as occluded by angiography, but patent by duplex. In 3, duplex found severe calcification of the bulb, disturbing visualisation. Thus, trickle flow with low flow velocities were obtained and severe stenosis was suspected although occlusion could not be excluded. In the other cases, duplex indicated a tight stenosis with low poststenotic flow velocities. Thus in each of these 5 cases, the sonographer recommended arteriography – which, due to the design of this study, was already planned for.

Discussion

The accuracy of duplex may be influenced by (a); elevated flow velocity contralateral to an occlusion, (b); tandem lesions, (c); the definition of the degree of stenosis, (d); the choice of duplex criterias, and (e); the fact, that angiography is a two dimensional modality while duplex refers to haemodynamic parameters.[3,4]

As angiography was recommended in all cases of doubt, including the 5 patients in whom duplex classified the ICA as severely stenotic and as occluded by angiography, we conclude that our duplex reliably identifies occlusion as well as stenoses ≥70% of the ICA.

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Table 1. Overall agreement between Duplex scanning and angiography (Kappa = 0.80).

Duplex	Arteriography			
	< 70%	≥70%	Occlusion	Total
< 70%	52	2		54
≥70%	8	47	5	60
Occlusion			15	15
Total	60	49	20	129

Identification of occulusion: sensititvity = 100%, positive predictive value (PPV) = (NPV) = 100%, negative predictive value (NPV) = 97% (n = 129). Identification of 70% stenosis of a patent artery: sensitivity = 94% specifically = 86%, and NPV = 96% (n = 109).

Like other authors, we find that internal evaluations of carotid DS is highly recommendable.

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